What is claimed is:

CLAIMS

1. An electrically continuous conformal EMI protective shield for adhering directly to and conforming with surfaces of a printed circuit board comprising:

a thermally conductive dielectric coating adhering directly to surfaces of the printed circuit board to provide an electrically nonconductive, thermally conductive, contiguous layer over all such printed circuit board surfaces; and

a conductive coating adhering directly to surfaces of the dielectric coating to provide an electrically conductive layer that prevents electromagnetic emissions from passing through the conformal EMI protective shield.

2. The conformal EMI shield of claim 1, wherein the thermally conductive dielectric coating comprises one of the group consisting of boron nitride (BN), aluminum oxide (AlO_3) and magnesium oxide (MgO).

3. The conformal EMI shield of claim 1, wherein the thermally conductive dielectric coating is formed from a thermally conductive dielectric dispersion comprising:

a base liquid;

a binder material suspended in the base liquid; and

a thermal loading material suspended in the base liquid.

4. The conformal EMI shield of claim 3,

wherein the thermal loading material comprises one of the group consisting of boron nitride (BN), aluminum oxide (AlO_3) and magnesium oxide (MgO).

5. The conformal EMI shield of claim 3, wherein the binder material comprises one of the group consisting of acrylic and urethane.

6. The conformal EMI shield of claim 3, wherein the base liquid and binder material are provided in an intermediate dispersion subsequently doped with the thermal loading material.

7. The conformal EMI shield of claim 3, wherein the base liquid is one of either water or an organic solvent.

8. The conformal EMI shield of claim 3, wherein the thermal loading material is 10%-80% and the binder is 90%-20% by weight of the thermally conductive dielectric dispersion.

9. The conformal EMI shield of claim 3, wherein the thermal loading materials is a 0.1-10 micron Boron Nitride powder.

10. The conformal EMI shield of claim 3, wherein the thermal loading materials is a 100 mesh, 99% corundum, alpha-phase Aluminum Oxide powder.

11. The conformal EMI shield of claim 1, wherein the thermally conductive dielectric coating has a viscosity of at least 45" #2 Zahn Cup (full body).

12. The conformal EMI shield of claim 1, wherein the thermally conductive dielectric coating has a viscosity in the range of 50-100" #2 Zahn Cup (full body).

13. The conformal EMI shield of claim 1, wherein the thermally conductive dielectric coating has an adhesion that enables it to pass the ASTM D-3359-83 Method A Tape Test using a 1" (25 mm wide) semi-transparent pressure-sensitive tape with an adhesion strength of 25-70 ounces per inch when tested in accordance with ASTM Test Method D-3330.

14. The conformal EMI shield of claim 1, wherein the thermally conductive dielectric coating is 1.5-2.0 mils thick.

15. The conformal EMI shield of claim 1, wherein the thermally conductive dielectric coating is formed from multiple applications each forming a 1 mil thick layer of thermally conductive dielectric.

16. A printed circuit board (PCB) comprising:
a printed wiring board;
a plurality of components mounted on the printed wiring board; and
a conformal coating secured to surfaces of at least a region of the PCB, comprising:
a conductive coating, conformingly and adheringly disposed on the PCB surfaces, that prevents electromagnetic waves from passing therethrough; and
a thermally conductive dielectric coating interposed between the conductive coating and predetermined portions of the PCB surfaces so as to completely insulate the predetermined PCB portions from current traveling through the conductive coating.

17. The printed circuit board of claim 16, wherein the thermally conductive dielectric coating comprises one of the group consisting of boron nitride (BN), aluminum oxide (AlO_3) and magnesium oxide (MgO).

18. The printed circuit board of claim 16, wherein the thermally conductive dielectric coating is formed from a thermally conductive dielectric dispersion comprising:
a base liquid comprising one of the group consisting of water and organic solvent;
a binder material suspended in the base liquid that comprises one of the group consisting of acrylic and urethane; and
a thermal loading material suspended in the base liquid that comprises one of the group consisting of boron nitride (BN), aluminum oxide (AlO_3) and magnesium oxide (MgO).

19. A method for coating a printed circuit board comprising:

providing a printed circuit board; and

conformingly adhering to the printed circuit board a continuous conformal coating for providing a substantially EMI-impervious shield comprising,

a thermally conductive dielectric coating adhering directly to surfaces of the printed circuit board to provide an electrically nonconductive, contiguous layer over all such printed circuit board surfaces; and

a contiguous conductive coating adhering directly to surfaces of the dielectric coating to provide an electrically conductive layer that prevents electromagnetic emissions from passing through the conformal EMI protective shield.

20. The method of claim 19, wherein the thermally conductive dielectric coating comprises one of the group consisting of boron nitride (BN), aluminum oxide (AlO_3) and magnesium oxide (MgO).